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東京大学理学部 1 号館西棟 11 階 1109 号室 (天文学専攻会議室) にて

“A new distance measure using the correlation between CO luminosity
and its line width”

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Does the dark energy vary over cosmic time? To answer this question, we need to map the expansion of the Universe over a large span of the cosmic time. Type Ia supernovae have been used to measure distances to $z \sim 1.7$, but beyond this, no reliable distance measure has been established. We propose a new distance measure using sub-millimeter (submm) galaxies to determine distances out to $z \sim 6$. Using a large sample of submm galaxies compiled from the literature, we show there exists a significant correlation between the CO luminosity (L'_{CO}) and the CO line width (FWHM) of submm galaxies. We use this correlation to measure intrinsic luminosity of submm galaxies, based on the observed FWHM. Through comparison with their observed brightness, we measure their luminosity distance, and construct the Hubble diagram to $z \sim 6$. Submm galaxies are detected all across the history of the Universe, including some at $z > 6$. With the advent of ALMA, it is expected that large numbers of distant submm galaxies will be discovered in the near future. This method is suitable for such an era, providing a new opportunity to constrain the earliest cosmic expansion. (<http://arxiv.org/abs/1505.00013>).